

AMENDMENT TO THE CLAIMS

In the Claims:

Please cancel original Claims 1-10, without prejudice, and add new Claims 11-56, such that the claims are as set forth below.

1-10. (Cancelled)

11. (New) A device for pumping a predetermined volume of fluid, comprising:
a cavity operably associated with an inlet and an outlet, the cavity at least partially defined by a resilient housing;

a source of fluid operably associated with the inlet;

an inlet check valve operably associated with the inlet and an outlet check valve operably associated with the outlet;

a member operably associated with the resilient housing, the member disposed in a first position by way of a biasing force and moveable therefrom to a second position, the member sufficient to fully compress the resilient housing when in one of the first position and the second position such that the cavity is empty of the predetermined volume of fluid, and sufficient to fully decompress the resilient housing when in a different one of the first position and the second position such that the cavity is filled with the predetermined volume of fluid; and

an actuator comprising a shape memory alloy, the actuator operably associated with the member and of a construction sufficient to move the member from the first position to the second position when the shape memory alloy undergoes a dimensional change relative to an original condition thereof, and sufficient to move the member from the second position to the first position when the shape memory alloy returns toward the original condition.

12. (New) The device of claim 11, the cavity being filled with the predetermined volume of fluid when the member is in the first position and being empty of the predetermined volume of fluid when the member is in the second position.

13. (New) The device of claim 11, the cavity being empty of the predetermined volume of fluid when the member is in the first position and being filled with the predetermined volume of fluid when the member is in the second position.

14. (New) The device of claim 11, wherein the resilient housing comprises a tube.

15. (New) The device of claim 11, wherein the resilient housing comprises a tube, the inlet comprises an inlet end of the tube, and the outlet comprises an outlet end of the tube.

16. (New) The device of claim 11, wherein the resilient housing comprises a diaphragm.

17. (New) The device of claim 11, wherein the resilient housing comprises a diaphragm sealed to a substrate, the inlet is operably associated with the substrate, and the outlet is operably associated with the substrate.

18. (New) The device of claim 11, wherein at least one of the inlet check valve and the outlet check valve comprises an elastomeric valve of a construction sufficient for being press-fit into a corresponding one of the inlet and the outlet.

19. (New) The device of claim 11, wherein at least one of the inlet check valve and the outlet check valve comprises an elastomeric valve of low cracking pressure.

20. (New) The device of claim 11, wherein at least one of the inlet check valve and the outlet check valve comprises an elastomeric valve of a construction sufficient to form a fluid-tight seal in the absence of back pressure.

21. (New) The device of claim 11, wherein the biasing force is supplied via the shape memory alloy.

22. (New) The device of claim 11, wherein the shape memory alloy is sufficient to move the member in one direction when the shape memory undergoes the dimensional

change, and sufficient to move the member in an opposite direction when the shape memory alloy returns toward the original condition.

23. (New) The device of claim 11, further comprising a biasing element operably associated with the member and of a construction sufficient to provide the biasing force.

24. (New) The device of claim 11, wherein the dimensional change is reversible, the member returning to the first position by way of the biasing force when the dimensional change is reversed.

25. (New) The device of claim 11, wherein the dimensional change is repeatable, the member movable from the first position to the second position at least two times.

26. (New) The device of claim 11, wherein a volume of the source of fluid diminishes concomitantly as fluid flows therefrom.

27. (New) The device of claim 11, wherein the fluid is a drug.

28. (New) The device of claim 11, wherein the fluid is insulin.

29. (New) The device of claim 28, the device sufficient to pump the predetermined volume of insulin substantially without damage.

30. (New) The device of claim 28, the device sufficient to pump the predetermined volume of insulin substantially without damage over a period of three days.

31. (New) The device of claim 28, the device sufficient to pump the predetermined volume of insulin up to 3000 times.

32. (New) The device of claim 11, wherein the predetermined volume of fluid is in a range of 0.5 microliter to 5 microliters.

33. (New) The device of claim 11, further comprising a housing for the cavity, the member, and the actuator, the housing of a construction sufficient for wearing by a user.

34. (New) The device of claim 11, further comprising a housing for the cavity, the member, the actuator, the inlet, and the source, the housing of a construction sufficient for wearing by a user.

35. (New) The device of claim 33 or claim 34, the housing comprising an adhesive sufficient for adhesion to the skin of a user.

36. (New) The device of claim 11, further comprising:
a source of electrical energy operably connected to the shape memory alloy of the actuator; and
a pulse-generating circuit operably connected to the source of electrical energy.

37. (New) The device of claim 36, wherein the pulse-generating circuit is programmable.

38. (New) The device of claim 36, the pulse-generating circuit comprising:
a battery, a capacitor, a timing circuit, and a transistor switch, wherein the battery and capacitor are operably connected to each other in parallel, the capacitor is operably connected to the shape memory alloy of the actuator via the transistor switch, and the timing circuit is operably connected to the battery and the transistor switch.

39. (New) The device of claim 38, wherein the capacitor is of lower equivalent series resistance than the battery.

40. (New) The device of claim 38, wherein, when the transistor switch is closed, electrical energy is provided to the shape memory alloy of the actuator primarily via the capacitor.

41. (New) The device of claim 38, wherein the timing circuit is programmable.

42. (New) The device of claim 36, the pulse-generating circuit comprising:
a battery, a capacitor, a signal converter, a timing circuit, and a transistor switch,
wherein the battery and capacitor are operably connected to each other in parallel via the
converter, the capacitor is operably connected to the shape memory alloy of the actuator via
the transistor switch, and the timing circuit is operably connected to the battery and the
transistor switch.

43. (New) The device of claim 42, wherein the signal converter is sufficient for
allowing the capacitor to be charged to an equal or greater extent than the battery.

44. (New) The device of claim 42, wherein the signal converter comprises a DC to
DC converter.

45. (New) The device of claim 42, wherein the transistor switch is sufficient for
modulation to transmit electrical energy in at least one pulse.

46. (New) The device of claim 42, further comprising an inductor and a diode,
wherein the capacitor is operably connected to the shape memory alloy of the actuator via the
transistor switch, the inductor, and the diode.

47. (New) The device of claim 46, wherein the inductor and the diode are
sufficient to allow electrical energy to flow through the shape memory alloy of the actuator
after the transistor switch, modulated to transmit electrical energy in at least one pulse, is
open.

48. (New) The device of claim 42, wherein the timing circuit is programmable.

49. (New) A method of pumping a predetermined volume of fluid, comprising:
providing a cavity operably associated with an inlet and an outlet, the cavity at least
partially defined by a resilient housing;

providing a source of fluid operably associated with the inlet, an inlet check valve operably associated with the inlet, and an outlet check valve operably associated with the outlet;

providing a member in a first position under bias;

providing a shape memory alloy operably associated with the member;

providing pulses of electricity to the shape memory alloy to move the member to a second position; and

ceasing the providing of pulses of electricity to the shape memory alloy to return the member to the first position;

the resilient housing being fully compressed when the member is in one of the first position and the second position such that the cavity is empty of the predetermined volume of fluid, and being fully decompressed the resilient housing when the member is in a different one of the first position and the second position such that the cavity is filled with the predetermined volume of fluid.

50. (New) The method of claim 49, further comprising cycling through said providing pulses of electricity to the shape memory alloy and said ceasing the providing of pulses of electricity to the shape memory alloy.

51. (New) The method of claim 49, wherein said providing pulses of electricity to the shape memory alloy and said ceasing the providing of pulses of electricity to the shape memory alloy are programmatically controlled.

52. (New) A method of pumping a predetermined volume of fluid, comprising:

providing a cavity operably associated with an inlet and an outlet, the cavity at least partially defined by a resilient housing;

providing a source of fluid operably associated with the inlet, an inlet check valve operably associated with the inlet, and an outlet check valve operably associated with the outlet;

providing a member in a first position under bias;

providing a shape memory alloy operably associated with the member;

increasing the temperature of the shape memory alloy to move the member to a second position; and

after said increasing, decreasing a temperature of the shape memory alloy to return the member to the first position;

the resilient housing being fully compressed when the member is in one of the first position and the second position such that the cavity is empty of the predetermined volume of fluid, and being fully decompressed the resilient housing when the member is in a different one of the first position and the second position such that the cavity is filled with the predetermined volume of fluid.

53. (New) The method of claim 52, wherein said increasing the temperature of the shape memory alloy comprises providing pulses of electricity.

54. (New) The method of claim 53, wherein said decreasing the temperature of the shape memory alloy comprises ceasing the providing of pulses of electricity.

55. (New) The method of claim 52, further comprising cycling through said increasing the temperature of the shape memory alloy and said decreasing the temperature of the shape memory alloy.

56. (New) The method of claim 52, wherein said increasing the temperature of the shape memory alloy and said decreasing the temperature of the shape memory alloy are programmatically controlled.